

REMARKS

Reconsideration of the application is requested in view of the above amendments and the following remarks. Claim 20 has been canceled. Claim 16 has been amended to include the limitations of claim 1. An editorial amendment has been made to claim 17. Claim 18 has been amended to include the limitations of canceled claim 20. Claim 19 has been amended to include the limitations of canceled claim 20 and a limitation from claim 15. An editorial change has been made to at page 7 of the specification. No new matter has been added.

§112 Rejection

Claim 16 was rejected under 35 U.S.C. §112, second paragraph, as being indefinite. As noted above, claim 16 has been amended to include the limitations of claim 1, and is now definite. Withdrawal of the rejection is respectfully requested.

§103 Rejections

Claims 1-3 and 16 were rejected under 35 U.S.C. §103(a) as being unpatentable over Hasegawa (U.S. 6,538,858) in view of Saito (U.S. 5,869,963). Applicants respectfully traverse this rejection.

Hasegawa discloses a magnetic sensor having a free magnetic layer 5 and a hard bias layer 6 that maintains the free magnetic layer 5 in a single domain state. Hasegawa fails to disclose or suggest that the hard bias layer 6 has a coercivity of at least 2,000 Oe, as required by claims 1 and 16.

Saito discloses a magnetoresistive sensor that includes a hard bias layer 5 having a coercive force of 1300 Oe, and further discloses that the presence of the hard bias layer 5 can reduce Barkhausen noise. However, Saito fails to disclose or suggest a hard bias layer having a coercivity of 2,000 Oe, as required by claim 1. Further, Saito fails to provide any suggestion or disclosure that raising the coercivity of hard bias layer 5 above 1,300 would affect the Barkhausen noise in either a positive or negative direction. Without such a disclosure or suggestion of the limitations of claim 1 and without a showing of what one of ordinary skill in the art would do with the limited disclosure of Hasegawa and Saito, the rejection fails to provide a prima facie showing of obviousness. Therefore, Applicants submit that claims 1-3 and 16 are allowable. Withdrawal of the rejection is respectfully requested.

Claims 4 and 11 were rejected under 35 U.S.C. §103(a) as being unpatentable over Hasegawa and Saito, and further in view of Gill (U.S. 6,052,263). Applicants respectfully traverse this rejection.

As discussed above, the Examiner has not set forth a prima facie showing of obviousness with respect to claim 1. Hasegawa and Saito fail to disclose or suggest every limitation of claim 1. Furthermore, Gill fails to remedy the deficiencies of Hasegawa and Saito as they relate to claim 1. Therefore, Applicants submit that claims 4 and 11 are allowable for at least the reason they are dependent upon an allowable base claim. Applicants do not otherwise concede the correctness of this rejection.

Claim 15 was rejected under 35 U.S.C. §103(a) as being unpatentable over Hasegawa. Applicants respectfully traverse this rejection.

Hasegawa discloses a hard bias layer having a thickness greater than a thickness of the free layer. However, Hasegawa fails to disclose or suggest a hard bias layer "having a magnetic remnance times thickness (Mrt) at least two times the value of the saturation magnetization times thickness (Mst) of the free layer," as required by claim 15. Because Hasegawa fails to provide any disclosure or suggestion of a ratio of the Mrt to the Mst of at least two, and there is no showing of what one of ordinary skill in the art would do with limited disclosure of Hasegawa, the rejection has not set forth a prima facie showing of obviousness. Therefore, Applicants submit that claim 15 is allowable. Withdrawal of the rejection is respectfully requested.

Claim 17 was rejected under 35 U.S.C. §103(a) as being unpatentable over Gill. Applicants respectfully traverse this rejection.

Gill discloses a magnetic tunnel junction device (MTJ), which is fundamentally different from the giant-magneto-resistive magnetic device required by claim 17 (see column 2 of Gill). The sensing or "free" layer 420 disclosed by Gill has top, bottom and side surfaces as shown in Figure 4. Gill also discloses a seed layer 440 and a ferromagnetic layer 430 that are positioned below the bottom surface of the free layer 410. Therefore, Gill fails to disclose or suggest "depositing a seed layer abutting the sensing layer at the side surface, . . . ; and depositing, subsequent to step (b), a layer of permanent magnetic material on the seed layer," as required by claim 17. Even if the layer 440 was construed as "abutting the sensing layer at the side surface" of the seed layer, it would not be possible to deposit the ferromagnetic layer 430 on the seed layer 440 subsequent to depositing the seed layer abutting the sensing layer because it is the

ferromagnetic layer 430 that is shown being arranged closer to free layer 410 than the seed layer 440. Thus, the configuration disclosed by Gill simply does not meet the limitations of claim 17.

Further to the above, Gill also fails to disclose or suggest a seed layer "comprising an alloy that includes two elements chosen from the group consisting essentially of W, Mo, Cr, V, Nb, Ta, Ti, Hf and Zr, wherein the two elements have different crystal structures," as required by claim 17. Although Gill may disclose the use of Cr in the seed layer, Gill clearly fails to disclose or suggest the use of two elements from the group listed in claim 17, much less two elements that have different crystal structures. Without such a disclosure or suggestion, this rejection fails to provide a prima facie showing of obviousness. Therefore, Applicants submit that claim 17 is allowable for this additional reason.

Still further to the above, Applicants respectfully traverse the statement in the rejection that mere routine experimentation and optimization by one skilled in the art would result in the combination of materials required by claim 17. The art of record discloses only the use of Cr in the seed layer. The present application provides ample experimental data that show unexpected advantages that result from the combination of materials required by claim 17, in particular the use of two elements that have different crystal structures. Therefore, Applicant submits that claim 17 is allowable for these additional reasons. Withdrawal of the rejection is respectfully requested.

Claims 18 and 19 were rejected under 35 U.S.C. §102(e) as being anticipated by Hasegawa. Applicants respectfully traverse this rejection. As claim 19 has been amended to include the subject matter of claim 20, which claim was rejected based on Hasegawa and Saito (noted below), Applicants will address the rejection of claims 18 and 19 to the extent the rejection of claim 20 may apply.

As discussed above, Hasegawa and Saito fail to disclose or suggest a hard bias layer having a coercivity of at least 2,000 Oe. Therefore, Hasegawa and Saito fail to disclose every limitation of claims 18 and 19 for at least those reasons presented above.

As further discussed above, Hasegawa fails to disclose a hard bias layer "having a magnetic remnance times thickness at least two times the value of the saturation magnetization times thickness of the free layer," as required by claim 19. Therefore, Hasegawa fails to disclose every limitation of claim 19 for this additional reason. Withdrawal of the rejection is respectfully requested.

Claim 20 was rejected under 35 U.S.C. §103(a) as being unpatentable over Hasegawa in view of Saito. Applicants respectfully traverse this rejection. Claim 20 has been canceled, rendering this rejection moot as to that claim. Applicants do not concede the correctness of this rejection.

Summary


Applicant respectfully requests that a timely Notice of Allowance be issued in this case. If the Examiner believes a telephone conference would advance the prosecution of this application, the Examiner is invited to telephone the undersigned at 612.371.5387.

Respectfully submitted,



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